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(54) Probe station with integrated environment control enclosure

Prüfstation mit integrierter Umgebungskontroleinrichtung

Station de test pour avec enveloppe à côntrole d'environnement intégré

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DE-A- 3 114 466
US-A- 3 333 274
US-A- 3 710 251

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Description

Background of the Invention

The present invention is directed to probe stations for making highly accurate measurements of high-speed, large scale integrated circuits at the wafer level, and of other electronic devices. More particularly, the invention relates to such a probe station having a controlled-environment enclosure for isolating the wafer-supporting chuck and probe(s) from outside influences such as electromagnetic interference (EMI), moist air during low-temperature measurements, and/or light.

For sensitive probing applications where electromagnetic interference or light must be eliminated, or where probing must be conducted at low test temperatures, an enclosure must be provided surrounding the test area. For low-temperature testing, the enclosure must provide a substantially hermetic seal for the introduction of a dry purge gas, such as nitrogen or dry air, to prevent condensation of moisture onto the wafer at the low test temperature.

Two different approaches have been used in the past for providing a controlled-environment enclosure. One approach has been to provide a large enclosure which surrounds the entire probe station, including its chuck and/or probe positioning mechanisms, as exemplified by the controlled-environment enclosures marketed by the Micromanipulator Company, Inc. of Carson City, Nevada and Temptronic Corporation of Newton, Massachusetts. However such large enclosures have several drawbacks. One of these is that they require the user to manipulate the station controls through the confines of rubber gloves mounted on the enclosure, making set-up and operation of the probe station more difficult and time-consuming for the operator. Another drawback is that the large volume of these enclosures requires a large volume of dry purge gas, requiring a correspondingly high charging time after each unloading and loading sequence, and a correspondingly high cost of the purge gas. These large enclosures also occupy an excessive amount of valuable laboratory space. Finally, where the enclosure surrounds the entire probe station, the device being tested is not shielded from the electromagnetic interference of probe station positioning motors and other sources of electrical noise on the station itself.

An alternative approach to controlled-environment enclosures for probe stations is a compact, integrated enclosure as exemplified in an article by Yousuke Yamamoto, entitled "A Compact Self-Shielding Prober for Accurate Measurement of On-Wafer Electron Devices," appearing in <u>IEEE Transactions on Instrumentation and Measurement</u>, Volume 38, No. 6, December, 1989, pp. 1088-1093. This controlled-environment enclosure is very compact since it is part of the probe station structure and encloses only the wafer-supporting surface of the chuck and the probe tips. While the small, integral enclosure solves some of the aforementioned problems of the larger enclosures, it is incapable of maintaining any electromagnetic or hermetic seal during relative positioning movement between the chuck wafer-supporting surface and the probe tips along the axis of approach by which the probe tips and chuck approach or withdraw from each other. Such a drawback is particularly critical with respect to thermal testing requiring a dry purge gas, since each repositioning of the wafer and probe relative to each other opens the enclosure and therefore requires re-purging. Moreover no individual probe tip movement to accommodate different contact patterns is provided with such an enclosure, thus sacrificing flexibility of the probe station to test a wide variety of different devices.

A probe station with an enclosure and stationary probes is disclosed in US-A-3 710 251. In US-A-3 333 274 a probe station according to the preamble of claim 1 is disclosed. In DE-A-3 114 466 seals which allow lateral movement are disclosed.

According to the present invention there is provided a probe station comprising a substantially planar surface for holding a test device on said surface, a holder for an electric probe for contacting the test device, and a pair of positioning mechanisms for selectively moving both said surface and said holder, independently of each other, toward or away from the other, characterised by a compact enclosure surrounding said surface and providing a controlled environment, the integrity of which can be maintained despite movement by said positioning mechanisms of each one of said surface and holder, respectively, toward or away from the other along an axis of approach, each one of said pair of positioning mechanisms being located at least partially outside of said enclosure, and extending between the exterior and interior of the enclosure.

The present invention compatibly solves all of the foregoing drawbacks of the prior probe stations by providing a probe station having an integrated environment control enclosure of relatively small size, with the positioning mechanism or mechanisms which position the probe(s) and/or wafer relative to each other being located at least partially outside of the enclosure. Despite the small size of the enclosure, however, the integrity of its EMI, hermetic, and/or light sealing capability is maintained throughout movement by the positioning mechanism of the wafer supporting surface or probe holder along the axis of approach, or along the other positioning axes. Such maintenance of the sealing integrity of the enclosure despite positioning movement is made possible by extending the positioning mechanism or mechanisms movably and sealably between the exterior and interior of the enclosure.

The sealing provided by the enclosure in the preferred embodiment is effective with respect to all three major environmental influences, i.e. EMI, substantial air leakage, and light; however it is within the scope of the invention for the sealing capability to be effective with

respect to any one or more of these influences, depending upon the application for which the probe station is intended. Likewise, in the preferred embodiment, multiple positioning mechanisms extend between the exterior and interior of the enclosure for positioning the wafer-supporting surface, the probes independently, and the probes in unison; however it is within the scope of the invention to provide any one or more of such positioning mechanisms in conjunction with the enclosure.

The foregoing and other objectives, features, and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

FIG. 1 is a partial front view of an exemplary embodiment of a wafer probe station constructed in accordance with the present invention.

FIG. 2 is a top view of the wafer probe station of FIG. 1.

FIG. 2A is a partial top view of the wafer probe station of FIG. 1 with the enclosure door shown partially open.

FIG. 3 is a partially sectional and partially schematic front view of the probe station of FIG. 1.

FIG. 4 is a top view of the sealing assembly where the wafer positioning mechanism extends through the bottom of the enclosure.

FIG. 5A is an enlarged top detail view taken along line 5A-5A of FIG. 1.

FIG. 5B is an enlarged top sectional view taken along line 5B-5B of FIG. 1.

FIG. 6 is a top detail view of the chuck assembly taken along line 6-6 of FIG. 3.

Description of the Preferred Embodiment

With reference to FIGS. 1, 2 and 3, an exemplary embodiment of the probe station of the present invention comprises a base 10 (shown partially) which supports a platen 12 through a number of jacks 14a, 14b, 14c, 14d which selectively raise and lower the platen vertically relative to the base by a small increment (approximately one-tenth of an inch) for purposes to be described hereafter. Also supported by the base 10 of the probe station is a motorized wafer positioner 16 having a rectangular plunger 18 which supports a movable chuck assembly 20. The chuck assembly 20 passes freely through a large aperture 22 in the platen 12 which permits the chuck assembly to be moved independently of the platen by the positioner 16 along X, Y and Z axes, i.e. horizontally along two mutually-perpendicular axes X and Y, and vertically along the Z axis. Likewise, the platen 12, when moved vertically by the jacks 14, moves independently of the chuck assembly 20 and the positioner 16

Mounted atop the platen 12 are multiple individual probe positioners such as 24 (only one of which is shown), each having an extending member 26 to which is mounted a probe holder 28 which in turn supports a respective wafer probe 30. The wafer probe 30 has a downwardly-inclined coplanar transmission line probe tip 32 for contacting wafers and other test devices mounted atop the chuck assembly 20, although other kinds of tips can be used as well. The probe positioner 24 has micrometer adjustments 34, 36 and 38 for adjusting the position of the probe holder 28, and thus the probe 30, along the X, Y and Z axes respectively, relative to the chuck assembly 20. The Z axis is exemplary of what is referred to herein loosely as the "axis of approach" between the probe holder 28 and the chuck assembly 20, although directions of approach which are neither vertical nor linear, along which the probe tip and wafer or other test device are brought into contact with each other, are also intended to be included within the meaning of the term "axis of approach." A further micrometer adjustment 40 adjustably tilts the probe holder 28 so that the plane of the probe tip 32 can be made parallel to the plane of the wafer or other test device supported by the chuck assembly 20. As many as twelve individual probe positioners 24, each supporting a respective probe, may be arranged on the platen 12 around the chuck assembly 20 so as to converge radially toward the chuck assembly similarly to the spokes of a wheel. With such an arrangement, each individual positioner 24 can independently adjust its respective probe in the X, Y and Z directions, while the jacks 14 can be actuated to raise or lower the platen 12 and thus all of the positioners 24 and their respective probes in unison.

An environment control enclosure is composed of an upper box portion 42 rigidly attached to the platen 12, and a lower box portion 44 rigidly attached to the base 10. Both portions are made of steel or other suitable electrically conductive material to provide EMI shielding. To accommodate the small vertical movement between the two box portions 42 and 44 when the jacks 14 are actuated to raise or lower the platen 12, an electrically conductive resilient foam gasket 46, preferably composed of silver or carbon-impregnated silicone, is interposed peripherally at their mating juncture at the front of the enclosure and between the lower portion 44 and the platen 12 so that an EMI, substantially hermetic, and light seal are all maintained despite relative vertical movement between the two box portions 42 and 44. Even though the upper box portion 42 is rigidly attached to the platen 12, a similar gasket 47 is preferably interposed between the portion 42 and the top of the platen to maximize sealing.

With reference to FIGS. 5A and 5B, the top of the upper box portion 42 comprises an octagonal steel box 48 having eight side panels such as 49a and 49b through which the extending members 26 of the respective probe positioners 24 can penetrate movably. Each

panel comprises a hollow housing in which a respective sheet 50 of resilient foam, which may be similar to the above-identified gasket material, is placed. Slits such as 52 are partially cut vertically in the foam in alignment with slots 54 formed in the inner and outer surfaces of each panel housing, through which a respective extending member 26 of a respective probe positioner 24 can pass movably. The slitted foam permits X, Y and Z movement of the extending members 26 of each probe positioner, while maintaining the EMI, substantially hermetic, and light seal provided by the enclosure. In four of the panels, to enable a greater range of X and Y movement, the foam sheet 50 is sandwiched between a pair of steel plates 55 having slots 54 therein, such plates being slidable transversely within the panel housing through a range of movement encompassed by larger slots 56 in the inner and outer surfaces of the panel housing.

Atop the octagonal box 48, a circular viewing aperture 58 is provided, having a recessed circular transparent sealing window 60 therein. A bracket 62 holds an apertured sliding shutter 64 to selectively permit or prevent the passage of light through the window. A stereoscope (not shown) connected to a CRT monitor can be placed above the window to provide a magnified display of the wafer or other test device and the probe tip for proper probe placement during set-up or operation. Alternatively, the window 60 can be removed and a microscope lens (not shown) surrounded by a foam gasket can be inserted through the viewing aperture 58 with the foam providing EMI, hermetic and light sealing.

The upper box portion 42 of the environment control enclosure also includes a hinged steel door 68 which pivots outwardly about the pivot axis of a hinge 70 as shown in FIG. 2A. The hinge biases the door downwardly toward the top of the upper box portion 42 so that it forms a tight, overlapping, sliding peripheral seal 68a with the top of the upper box portion. When the door is open, and the chuck assembly 20 is moved by the positioner 16 beneath the door opening as shown in FIG. 2A, the chuck assembly is accessible for loading and unloading.

With reference to FIGS. 3 and 4, the sealing integrity of the enclosure is likewise maintained throughout positioning movements by the motorized positioner 16 due to the provision of a series of four sealing plates 72, 74, 76 and 78 stacked slidably atop one another. The sizes of the plates progress increasingly from the top to the bottom one, as do the respective sizes of the central apertures 72a, 74a, 76a and 78a formed in the respective plates 72, 74, 76 and 78, and the aperture 79a formed in the bottom 44a of the lower box portion 44. The central aperture 72a in the top plate 72 mates closely around the bearing housing 18a of the vertically-movable plunger 18. The next plate in the downward progression, plate 74, has an upwardly-projecting peripheral margin 74b which limits the extent to which the plate 72 can slide across the top of the plate 74. The central aperture 74a in the plate 74 is of a size to permit the positioner 16 to move the plunger 18 and its bearing housing 18a transversely along the X and Y axes until the edge of the top plate 72 abuts against the margin 74b of the plate 74. The size of the aperture 74a is, however, too small to be uncovered by the top plate 72 when such abutment occurs, and therefore a seal is maintained between the plates 72 and 74 regardless of the movement of the plunger 18 and its bearing housing along the X and Y axes. Further movement of the plunger 18 and bearing housing in the direction of abutment of the plate 72 with the margin 74b results in the sliding of the plate 74 toward the peripheral margin 76b of the next underlying plate 76. Again, the central aperture 76a in the plate 76 is large enough to permit abutment of the plate 74 with the margin 76b, but small enough to prevent the plate 74 from uncovering the aperture 76a, thereby likewise maintaining the seal between the plates 74 and 76. Still further movement of the plunger 18 and bearing housing in the same direction causes similar sliding of the plates 76 and 78 relative to their underlying plates into abutment with the margin 78b and the side of the box portion 44, respectively, without the apertures 78a and 79a becoming uncovered. This combination of sliding plates and central apertures of progressively increasing size permits a full range of movement of the plunger 18 along the X and Y axes by the positioner 16, while maintaining the enclosure in a sealed condition despite such positioning movement. The EMI sealing provided by this structure is effective even with respect to the electric motors of the positioner 16, since they are located below the sliding plates.

With particular reference to FIGS. 3 and 6, the chuck assembly 20 is of a unique modular construction usable either with or without an environment control enclosure. The plunger 18 supports an adjustment plate 81 which in turn supports a rectangular stage 83 which detachably mounts a circular wafer chuck 80 of conventional design by means of screws such as 87. Shims such as 85 providing leveling. The wafer chuck 80 has a planar upwardly-facing wafer-supporting surface 82 having an array of vertical apertures 84 therein. These apertures communicate with respective chambers separated by O-rings 88, the chambers in turn being connected separately to different vacuum lines 90a, 90b, 90c communicating through separately-controlled vacuum valves (not shown) with a source of vacuum. The respective vacuum lines selectively connect the respective chambers and their apertures to the source of vacuum to hold the wafer, or alternatively isolate the apertures from the source of vacuum to release the wafer, in a conventional manner. The separate operability of the respective chambers and their corresponding apertures enables the chuck to hold wafers of different diameters.

In addition to the circular wafer chuck 80, up to four auxiliary chucks such as 92 and 94 are detachably mounted on the corners of the stage 83 by screws such

as 96 independently of the wafer chuck 80. Each auxiliary chuck 92, 94 has its own separate upwardly-facing planar surface 100, 102 respectively, in parallel relationship to the surface 82 of the wafer chuck 80. Vacuum apertures 104 protrude through the surfaces 100 and 102 from communication with respective chambers 106, 108 within the body of each auxiliary chuck. Each of these chambers in turn communicates through a separate vacuum line 110 and a separate independently-actuated vacuum valve 114 with a source of vacuum 118 as shown schematically in FIG. 3. Each of the valves 114 selectively connects or isolates a respective chamber 106 or 108 with respect to the source of vacuum independently of the operation of the apertures 84 of the wafer chuck 80, so as to selectively hold or release a contact substrate or calibration substrate located on the respective surfaces 100 and 102 of the auxiliary chucks independently of the wafer.

The detachable interconnection of the auxiliary chucks 92 and 94 with respect to the wafer chuck 80 enables not only the independent replacement of the different chucks but also enables the respective elevations of the surfaces of the chucks to be adjusted vertically with respect to each other. As shown in FIG. 3, auxiliary chuck shims such as 120 can be inserted between the stage 83 and the auxiliary chuck to adjust the elevation of the auxiliary chuck's upper surface relative to that of the wafer chuck 80 and the other auxiliary chuck(s). This compensates for any differences in thicknesses between the wafer, contact substrate and calibration substrate which are simultaneously carried by the chuck assembly 20, so that the probes are easily transferable from one to the other without differences in contact pressure or the threat of damage to the probe tips.

When used with an environment control enclosure, the vacuum valves 114 of the respective auxiliary chucks are located remotely from the chucks, and preferably exterior of the enclosure as indicated schematically in FIG. 3 to enable control of the auxiliary chucks despite the impediment to access created by the enclosure. This enables use of auxiliary chucks compatibly with such an enclosure, which is particularly critical because the presence of the auxiliary chucks eliminates the need for repetitive unloading and loading of contact substrates and calibration substrates during set-up and calibration, and thus eliminates the attendant need for repetitive and time-consuming purging of the environment control enclosure. The modular, detachably interconnected chuck assembly is also particularly advantageous when combined with a controlled-environment probe station because of the need for interchangeability of the numerous different types of wafer chucks usable with such a probe station.

The terms and expressions which have been employed in the foregoing specification are used therein as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding equivalents of the features shown and described or portions thereof, it being recognized that the scope of the invention is defined and limited only by the claims which follow.

Claims

1. A probe station comprising a substantially planar surface (82) for holding a test device on said surface (82), a holder (28) for an electric probe (30) for contacting the test device, and a pair of positioning mechanisms (16,24) for selectively moving both said surface (82) and said holder (28), independently of each other, toward or away from the other, characterised by a compact enclosure (12,42,44) surrounding said surface (82) and providing a controlled environment, the integrity of which can be maintained despite movement by said positioning mechanisms (16,24) of each one of said surface (82) and holder (28), respectively, toward or away from the other along an axis of approach, each one of said pair of positioning mechanisms (16,24) being located at least partially outside of said enclosure (12,42,44), and extending between the exterior and interior of the enclosure (12,42,44).

2. The probe station of claim 1 wherein said enclosure provides a substantially hermetic seal around said surface.

3. The probe station of Claim 1 wherein said enclosure provides a shield against electromagnetic interference.

4. The probe station of Claim 1 wherein said enclosure (12,42,44) includes a plurality of resilient sheets (50) each with an aperture (52) therein for maintaining a controlled environment integrity around said surface (82) despite movement by said positioning mechanism (24) of said holder (28) toward or away from said surface (82), said positioning mechanism (24) including a member (26) extending movably between the exterior and the interior of said enclosure (12,42,44) through one of said apertures (52) and movable with respect to said enclosure (12,42,44) without breaching the integrity of the controlled environment.

5. The probe station of Claim 4 wherein said enclosure (12,42,44) includes at least one sealing plate (55) which is movable with respect to the remainder of said enclosure (12,42,44) and through which said member (26) protrudes, one of said resilient sheets (50) being mounted on said sealing plate (55) so as to move in unison with said plate (55) with respect to the remainder of said enclosure (12,42,44).

6. The probe station of Claim 5 wherein said sealing

plate (55) is slidably movable with respect to the remainder of said enclosure (12,42,44).

7. The probe station of Claim 1 further including a platform (12,42) mounting a plurality of said holders (28) and a third positioning mechanism (14a, 14b, 14c,14d) for selectively moving said platform (12,42) and thereby moving said plurality of holders (28) in unison toward or away from the test device.

8. The probe station of Claim 7 wherein said plurality of holders (28) are movably mounted on said platform (12,42) independently of each other so as to be movable separately toward or away from the test device.

9. The probe station of Claim 7 wherein all of said positioning mechanisms (14,24; 14a,14b,14c,14d) are located at least partially outside of said enclosure (12,42.44).

10. The probe station of Claim 1 wherein said positioning mechanism (16) for selectively moving said surface can move said surface (82) relative to said holder (28) in a direction substantially parallel to the plane of said surface (82) and wherein said enclosure (12,42,44) includes multiple plates (72,74,76,78) slidable with respect to each other and with respect to the remainder of said enclosure (12,42,44), each plate (72.74.76,78) and apertures (72a,74a,76a,78a) being of different sizes, and said positioning mechanism (16) for moving said surface (82) includes a member (18) extending through said apertures (72a,74a,76a,78a) in said plates (72,74,76,78) between the exterior and interior of said enclosure (12,42,44) and movable in said direction relative to said enclosure (12,42,44) said plates (72,74,76,78) being capable of maintaining a controlled environment integrity around said surface (82) despite movement of said member (18) in said direction.

11. The probe station as claimed in Claim 1, said enclosure (12,42,44) having an upper box portion (42) movable in a vertical direction relative to a lower box portion (44) whilst maintaining a seal around said surface.

12. The probe station of Claim 2 wherein said enclosure provides a shield against light.

13. The probe station of Claim 1 wherein said enclosure (12,42,44) has an opening for providing access to said surface (82) for enabling different test devices to be placed on said surface through said opening, and a door (63) for selectively closing said opening, each positioning mechanism (16,24) being capable of mechanically transferring movement to the corresponding one of said surface and said holder while said door is closed.

14. The probe station of Claim 11 wherein said holder (28) is movable by its respective positioning mechanism (24) both toward and away from, and laterally with respect to, said upper box portion (42).

15. The probe station of Claim 11, including a further holder (28) for a further electrical probe (30), and a further positioning mechanism (14a,14b,14c,14d), each holder (28) being supported by said upper box portion (42) of said enclosure and said upper box portion being movable by said further positioning mechanism so as to move both of said holders (28) in unison.

16. The probe station of Claim 1, including a further holder (28) for a further electrical probe (30), and a further positioning mechanism (24) for moving said further holder (28), an upper portion (42) of said enclosure defining at least a pair of openings (52) each for separately receiving the insertion of a respective mechanical member (26) into said enclosure from a respective positioning mechanism (24) for moving a respective electrical probe (30).

17. Use of a probe station as claimed in any one of the preceding claims to probe a test device.

Patentansprüche

1. Prüfstation, welche eine im wesentlichen ebene Fläche (82) zum Halten einer Prüfeinrichtung auf der Fläche (82), eine Halteeinrichtung (28) für einen elektrischen Meßfühler (30) zum Kontaktieren der Prüfeinrichtung und ein Paar Positioniermechanismen (16, 24) zum selektiven Bewegen sowohl der Oberfläche (82) als auch der Halteeinrichtung (28) unabhängig voneinander und aufeinander zu oder voneinander weg aufweist, **gekennzeichnet durch** ein kompaktes Gehäuse (12, 42, 44), welches die Oberfläche (82) umgibt und eine geschützte Umgebung schafft, dessen Integrität trotz der durch die Positioniermechanismen (16, 24) herbeigeführten Bewegung sowohl der Oberfläche (82) als auch der Halteeinrichtung (28) aufeinander zu oder voneinander weg entlang einer Heranführungsachse beibehalten wird, wobei jeder einzelne des Paars von Positioniermechanismen wenigstens teilweise außerhalb des Gehäuses (12, 42, 44) angeordnet ist und sich zwischen dem Außenraum und dem Innenraum des Gehäuses (12, 42, 44) erstreckt.

2. Prüfstation nach Anspruch 1, **dadurch gekennzeichnet**, daß das Gehäuse einen im wesentlichen hermetischen Abschluß um die Oberfläche herbei-

führt.

3. Prüfstation nach Anspruch 1, **dadurch gekennzeichnet,** daß das Gehäuse eine Abschirmung gegen elektromagnetische Störeinflüsse schafft.

4. Prüfstation nach Anspruch 1, **dadurch gekennzeichnet,** daß das Gehäuse (12, 42, 44) mehrere elastische, jeweils mit einer Öffnung (52) versehene Schichten (50) zum Beibehalten einer umgebungsgeschützten Integrität um die Oberfläche (82) trotz einer Bewegung der Halteeinrichtung (28) hin zu oder weg von der Oberfläche (82) durch den Positioniermechanismus (24) aufweist, wobei der Positioniermechanismus (24) einen Körper (26) umfaßt, welcher sich bewegbar zwischen der äußeren Umgebung und dem Innenraum des Gehäuses (12, 42, 44) durch eine der Öffnungen (52) erstreckt und in bezug auf das Gehäuse (12, 42, 44) ohne ein Verletzen der Integrität der geschützten Umgebung bewegbar ist.

5. Prüfstation nach Anspruch 4, **dadurch gekennzeichnet,** daß das Gehäuse (12, 42, 44) wenigstens eine abdichtende Platte (55) aufweist, die in bezug auf den Rest des Gehäuses (12, 42, 44) bewegbar ist und durch die sich der Körper (26) hindurcherstreckt, wobei eine der elastischen Schichten (50) auf der abdichtenden Platte (55) angebracht ist und sich zusammen mit der Platte in bezug auf den Rest des Gehäuses (12, 42, 44) bewegt.

6. Prüfstation nach Anspruch 5, **dadurch gekennzeichnet,** daß die abdichtende Platte (55) gleitend in bezug auf den Rest des Gehäuses (12, 42, 44) bewegbar ist.

7. Prüfstation nach Anspruch 1, **gekennzeichnet durch** eine Plattform (12, 42), welche eine Vielzahl von Halteeinrichtungen (28) und einen dritten Positioniermechanismus (14a, 14b, 14c, 14d) zum selektiven Bewegen der Plattform (12, 42) und dadurch zum gemeinsamen Bewegen der Vielzahl von Halteeinrichtungen (28) hin oder weg von der Testeinrichtung trägt.

8. Prüfstation nach Anspruch 7, **dadurch gekennzeichnet,** daß die mehreren Halteeinrichtungen (28) unabhängig voneinander auf der Plattform (12, 42) bewegbar angebracht und somit getrennt zur Testeinrichtung oder weg von dieser bewegbar sind.

9. Prüfstation nach Anspruch 7, **dadurch gekennzeichnet,** daß sämtliche Positioniermechanismen (14, 24; 14a, 14b, 14c, 14d) wenigstens teilweise außerhalb des Gehäuses (12, 42, 44) angeordnet sind.

10. Prüfstation nach Anspruch 1, **dadurch gekennzeichnet,** daß der Positioniermechanismus (16) zum selektiven Bewegen der Oberfläche die Oberfläche (82) relativ zur Halteeinrichtung (28) in einer Richtung im wesentlichen parallel zur Ebene der Oberfläche (82) bewegen kann und daß das Gehäuse (12, 42, 44) mehrere in bezug zueinander und in bezug auf den Rest des Gehäuses (12, 42, 44) verschiebbare Platten (72, 74, 76, 78) aufweist, wobei jede Platte (72, 74, 76, 78) und Öffnungen (72a, 74a, 76a, 78a) unterschiedliche Größen aufweisen und der Positioniermechanismus (16) zum Bewegen der Oberfläche (82) einen Körper (18) aufweist, welcher sich durch die Öffnungen (72a, 74a, 76a, 78a) in den Platten (72, 74, 76, 78) zwischen der Außenseite und dem Innenraum des Gehäuses (12, 42, 44) hindurcherstreckt und in dieser Richtung relativ zum Gehäuse (12, 42, 44) bewegbar ist, wobei die Platten (72, 74, 76, 78) in der Lage sind, eine umgebungsgeschützte Integrität um die Oberfläche (82) trotz der Bewegung des Körpers (18) in dieser Richtung beizubehalten.

11. Prüfstation nach Anspruch 1, **dadurch gekennzeichnet,** daß das Gehäuse (12, 42, 44) einen oberen Kastenabschnitt (42), welcher in einer vertikalen Richtung relativ zu einem unteren Kastenabschnitt (44) bewegbar ist, währenddessen eine Abdichtung um die Oberfläche beibehalten bleibt.

12. Prüfstation nach Anspruch 2, **dadurch gekennzeichnet,** daß das Gehäuse eine Abschirmung gegen Licht bietet.

13. Prüfstation nach Anspruch 1, **dadurch gekennzeichnet,** daß das Gehäuse (12, 42, 44) eine Öffnung zum Schaffen eines Zugangs zu der Oberfläche (82), um zu ermöglichen, mehrere unterschiedliche Testeinrichtungen durch die Öffnung auf der Oberfläche anzuordnen, und eine Tür (68) zum selektiven Schließen der Öffnung aufweist, wobei jeder Positioniermechanismus (16, 24) eine mechanisch überführende Bewegung zu der entsprechenden einen Oberfläche und dem Halter durchführen kann, während die Tür geschlossen ist.

14. Prüfstation nach Anspruch 11, **dadurch gekennzeichnet,** daß die Halteeinrichtung (28) durch ihren jeweiligen Positioniermechanismus (24) sowohl hin zu dem oberen Kastenabschnitt (42) als auch weg von diesem sowie seitlich in bezug auf diesen bewegbar ist.

15. Prüfstation nach Anspruch 11, **gekennzeichnet durch** eine weitere Halteeinrichtung (28) für einen weiteren elektrischen Meßfühler (30) und einen

weiteren Positioniermechanismus (14a, 14b, 14c, 14d), wobei jede Halteeinrichtung (28) durch den oberen Kastenabschnitt (42) des Gehäuses abgestützt ist und der obere Kastenabschnitt durch den weiteren Positioniermechanismus bewegbar ist, um beide Halteeinrichtungen (28) im Einklang miteinander zu bewegen.

16. Prüfstation nach Anspruch 1, **gekennzeichnet durch** eine weitere Halteeinrichtung (28) für einen weiteren elektrischen Meßfühler (30) und einen weiteren Positioniermechanismus (24) zum Bewegen der weiteren Halteeinrichtung (28), wobei ein oberer Abschnitt (42) des Gehäuses wenigstens ein Paar von Öffnungen (52) jeweils zum separaten Aufnehmen des Einsatzes eines jeweiligen mechanischen Körpers (26) von einem jeweiligen Positioniermechanismus (24) in das Gehäuse zum Bewegen eines jeweiligen elektrischen Meßfühlers (30) festlegt.

17. Verwendung einer Prüfstation nach einem der vorhergehenden Ansprüche zum Prüfen einer Testeinrichtung.

Revendications

1. Station de contrôle, comprenant une surface sensiblement plane (82) destinée à tenir un dispositif de test sur la dite surface (82), un porte-sonde (28) pour une sonde électrique (30) destinée à venir au contact du dispositif de test, et une paire de mécanismes de positionnement (16, 24) destinés à déplacer sélectivement, l'un ou l'autre de la dite surface (82) et du dit porte-sonde (28), indépendamment l'un de l'autre, en les rapprochant ou en les éloignant, caractérisée par une enceinte compacte (12, 42, 44) entourant la dite surface (82) et procurant un environnement régulé, et dont l'intégrité peut être maintenue en dépit du déplacement, opéré par les dits mécanismes de positionnement (16, 24), de chacun de la dite surface (82) et du dit porte-sonde (28), respectivement, les rapprochant ou les éloignant selon un axe d'approche, chacun de la dite paire de mécanismes de positionnement (16, 24) étant situé au moins partiellement à l'extérieur de la dite enceinte (12, 42, 44), et s'étendant entre l'extérieur et l'intérieur de l'enceinte (12, 42, 44).

2. Station de contrôle selon la revendication 1, dans laquelle la dite enceinte réalise un joint d'étanchéité sensiblement hermétique autour de la dite surface.

3. Station de contrôle selon la revendication 1, dans laquelle la dite enceinte réalise un blindage vis-à-vis d'une interférence électromagnétique.

4. Station de contrôle selon la revendication 1, dans laquelle la dite enceinte (12, 42, 44) inclut une pluralité de feuilles résilientes (50) comportant chacune une ouverture (52) en elle et destinée à maintenir l'intégrité de l'environnement régulé autour de la dite surface (82) en dépit du déplacement, opéré par le dit mécanisme de positionnement (24), qui rapproche ou qui éloigne le dit porte-sonde (28) de la dite surface (82), le dit mécanisme de positionnement (24) incluant un élément (26) s'étendant, de façon mobile, entre l'extérieur et l'intérieur de l'enceinte (12, 42, 44) à travers l'une des dites ouvertures (52) et pouvant se déplacer par rapport à la dite enceinte (12, 42, 44) sans rompre l'intégrité de l'environnement régulé.

5. Station de contrôle selon la revendication 4, dans laquelle la dite enceinte (12, 42, 44) inclut au moins une plaque d'étanchéité (55) qui peut se déplacer par rapport à la partie restante de la dite enceinte (12, 42, 44), et à travers laquelle dépasse le dit élément (26), l'une des dites feuilles résilientes (50) étant montée sur la dite plaque d'étanchéité (55) de manière à se déplacer à l'unisson de la dite plaque (55) par rapport à la partie restante de la dite enceinte (12, 42, 44).

6. Station de contrôle selon la revendication 5, dans laquelle la dite plaque (55) peut se déplacer, en glissant, par rapport à la partie restante de la dite enceinte (12, 42, 44).

7. Station de contrôle selon la revendication 1, incluant, en outre, une plate-forme (12, 42) sur laquelle est montée une pluralité des dits porte-sondes (28), et un troisième mécanisme de positionnement (14a, 14b, 14c, 14d) destiné à déplacer sélectivement la dite plate-forme (12, 42), déplaçant ainsi à l'unisson la dite pluralité de porte-sondes (28) en la rapprochant ou en l'éloignant du dispositif de test.

8. Station de contrôle selon la revendication 7, dans laquelle la dite pluralité de porte-sondes (28) sont montés, de façon mobile, sur la dite plate-forme (12, 42), indépendamment les uns des autres, de manière à pouvoir se dépacer séparément, en se rapprochant ou en s'éloignant du dispositif de test.

9. Station de contrôle selon la revendication 7, dans laquelle la totalité des dits mécanismes de positionnement (14, 24 ; 14a, 14b, 14c, 14d) sont situés au moins partiellement à l'extérieur de la dite enceinte (12, 42, 44), et s'étendant entre l'extérieur et l'intérieur de l'enceinte (12, 42, 44).

10. Station de contrôle selon la revendication 1, dans laquelle le dit mécanisme de positionnement (16) destiné à déplacer sélectivement la dite surface

peut déplacer la dite surface (82) par rapport au dit porte-sonde (28) selon une direction sensiblement parallèle au plan de la dite surface (82), et dans laquelle la dite enceinte (12, 42, 44) inclut de multiples plaques (72, 74, 76, 78) pouvant glisser les unes par rapport aux autres et par rapport à la partie restante de la dite enceinte (12, 42, 44), chaque plaque (72, 74, 76, 78) et ouverture (72a, 74a, 76a, 78a) étant de taille différente, et le dit mécanisme de positionnement (16) destiné à déplacer sélectivement la dite surface (82) inclut un élément (18) s'étendant à travers les dites ouvertures (72a, 74a, 76a, 78a) des dites plaques (72, 74, 76, 78), entre l'extérieur et l'intérieur de l'enceinte (12, 42, 44), et pouvant se déplacer selon la dite direction par rapport à la dite enceinte (12, 42, 44), les dites plaques (72, 74, 76, 78) étant aptes à maintenir l'intégrité de l'environnement régulé autour de la dite surface (82) en dépit du déplacement du dit élément (18) selon la dite direction.

11. Station de contrôle selon la revendication 1, la dite enceinte (12, 42, 44) comportant une partie carrée supérieure (42) pouvant se déplacer selon une direction verticale par rapport à une partie carrée inférieure (44) tout en maintenant une étanchéité autour de la dite surface.

12. Station de contrôle selon la revendication 2, dans laquelle la dite enceinte réalise un blindage vis-à-vis de la lumière.

13. Station de contrôle selon la revendication 1, dans laquelle la dite enceinte (12, 42, 44) comporte une ouverture assurant un accès à la dite surface (82) afin de permettre à différents dispositifs de test d'être placés sur la dite surface à travers la dite ouverture, et une trappe (68) destinée à fermer sélectivement la dite ouverture, chaque mécanisme de positionnement (16, 24) étant apte à tranférer mécaniquement un déplacement à l'un correspondant de la dite surface et du dit porte-sonde alors que la dite trappe est fermée.

14. Station de contrôle selon la revendication 11, dans laquelle le dit porte-sonde (28) peut se déplacer sous l'action de son mécanisme de positionnement respectif (24) en se rapprochant et en s'éloignant de la dite partie carrée supérieure (42), latéralement par rapport à celle-ci.

15. Station de contrôle selon la revendication 11, incluant un porte-sonde supplémentaire (28) destiné à une sonde électrique supplémentaire (30), et un mécanisme de positionnement supplémentaire (14a, 14b, 14c, 14d), chaque porte-sonde (28) étant supporté par la dite partie carrée supérieure (42) de la dite enceinte et la dite partie carrée supérieure pouvant se déplacer sous l'action du dit mécanisme de positionnement supplémentaire de manière à déplacer à l'unisson les deux dits porte-sondes (28).

16. Station de contrôle selon la revendication 1, incluant un porte-sonde supplémentaire (28) destiné à une sonde électrique supplémentaire (30), et un mécanisme de positionnement supplémentaire (24) destiné à déplacer le dit porte-sonde supplémentaire (28), une partie supérieure (42) de la dite enceinte définissant au moins une paire d'ouvertures (52) destinées chacune à recevoir séparément l'insertion d'un élément mécanique respectif (26) dans la dite enceinte à partir d'un mécanisme de positionnement respectif (24) de manière à déplacer une sonde électrique respective (30).

17. Utilisation d'une station de contrôle selon l'une quelconque des revendications précédentes afin de contrôler un dispositif de test.

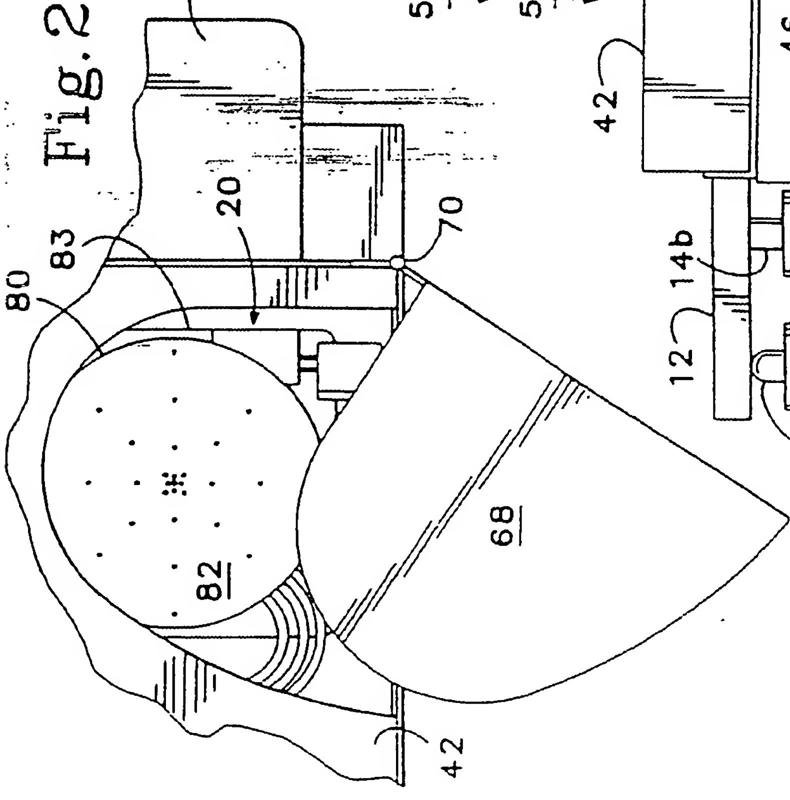
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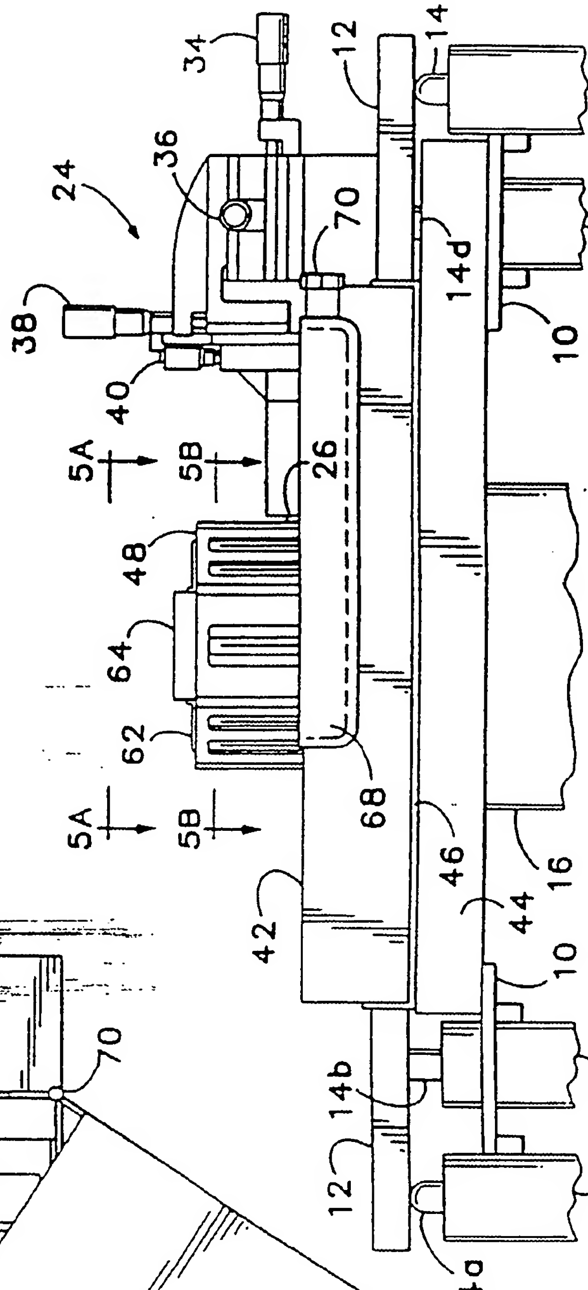
Fig. 2A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44
14b
14a

Fig. 1

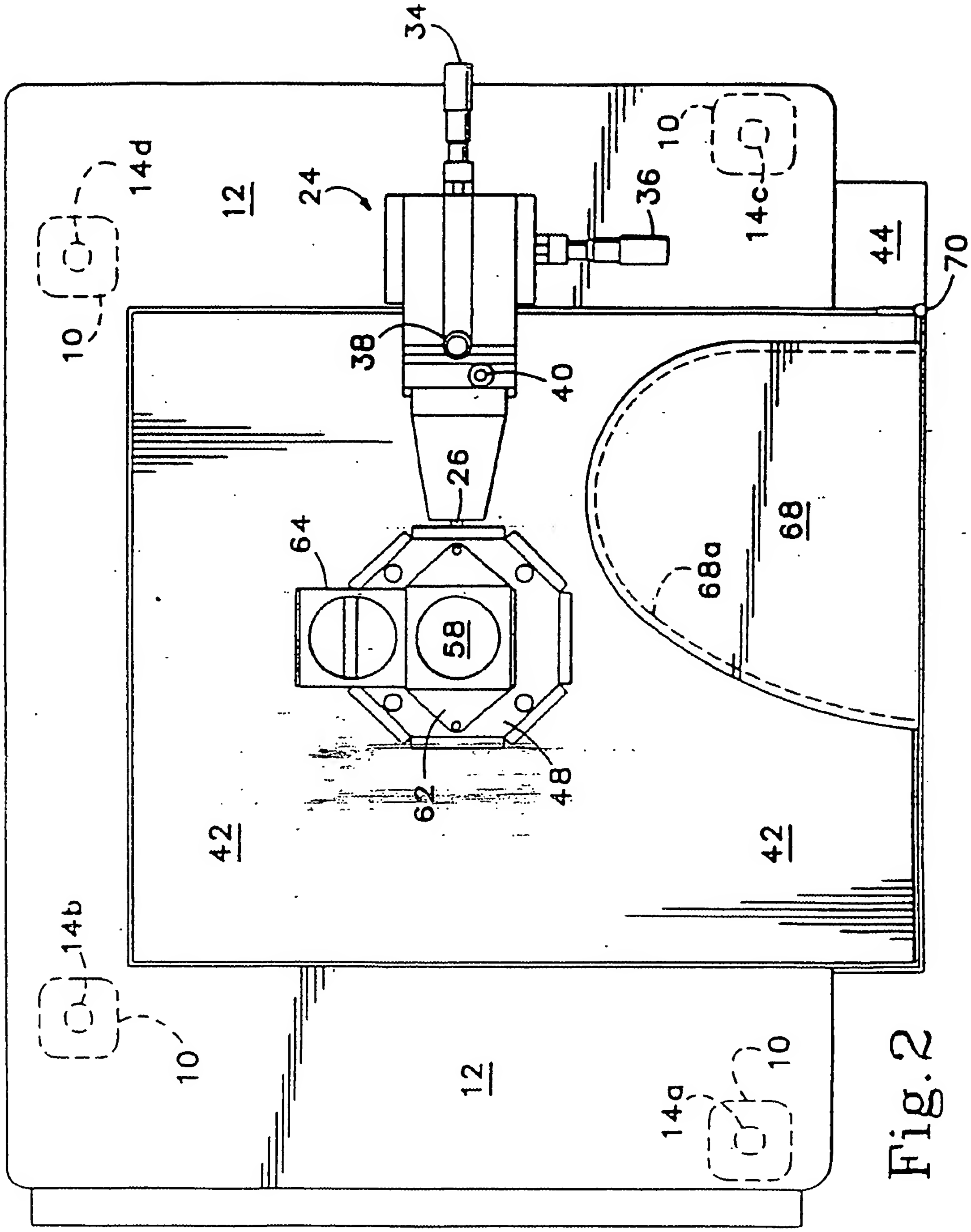
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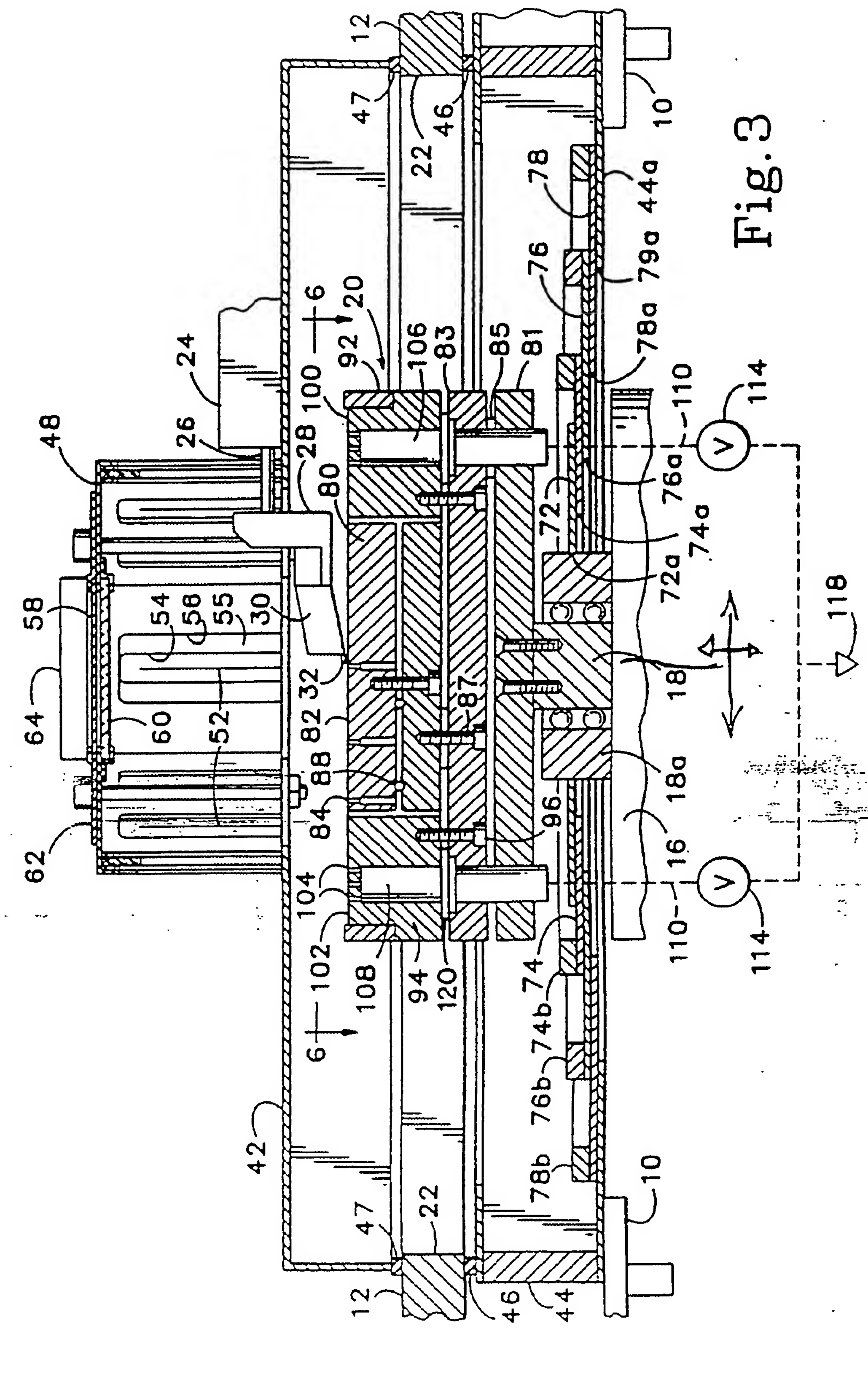
Fig.2



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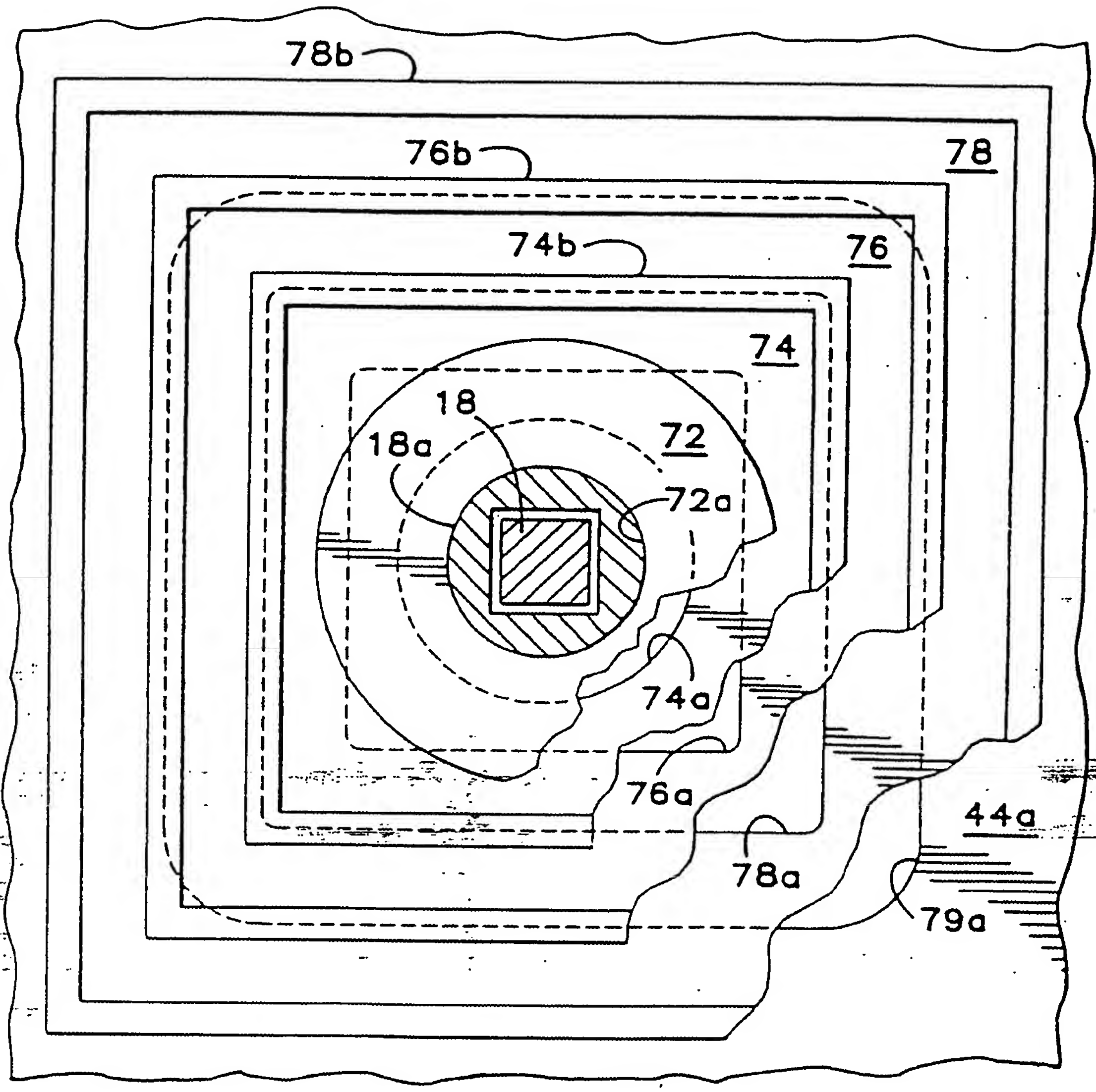

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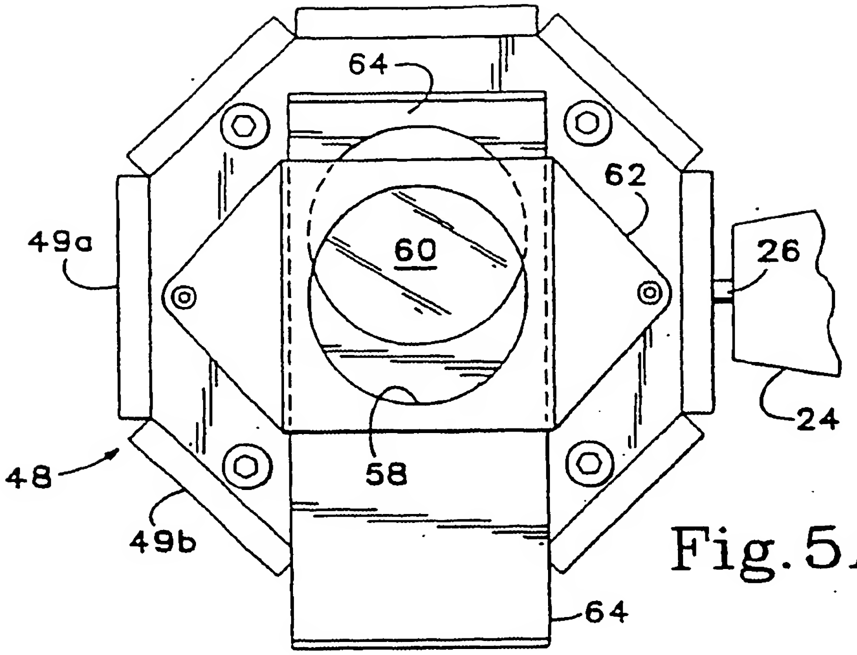
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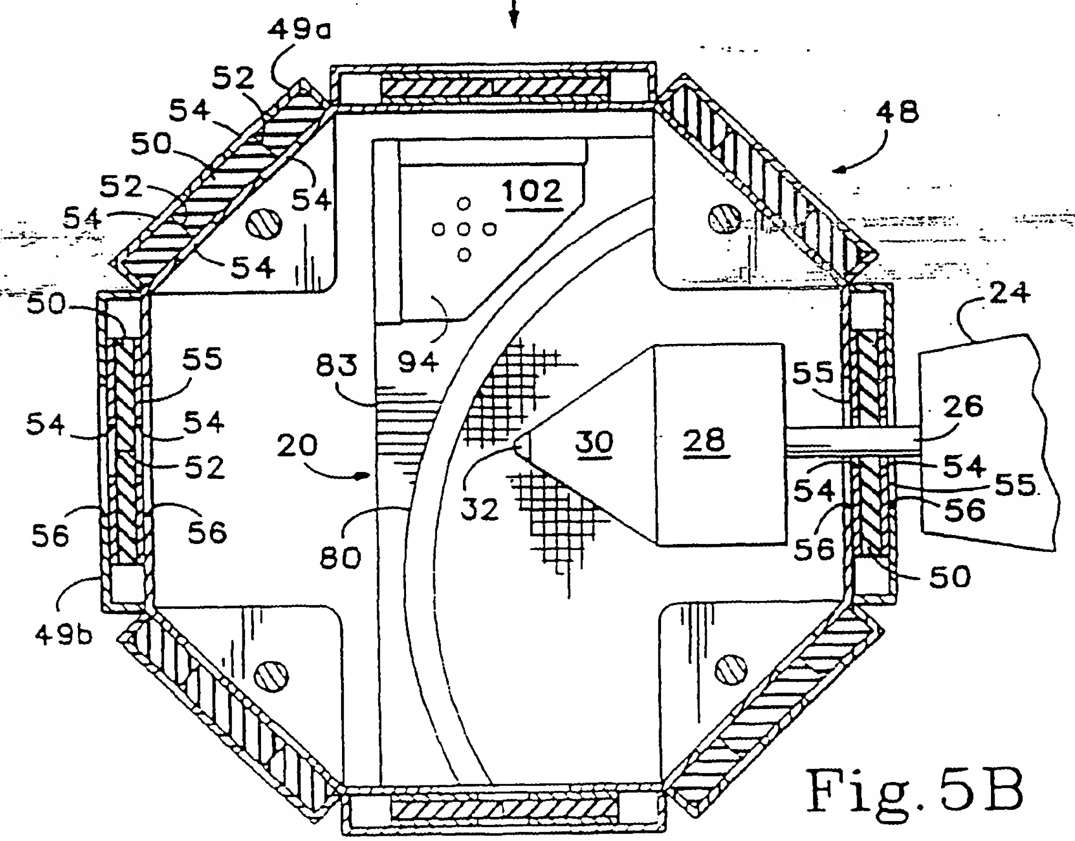
Fig. 5A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50
49b

Fig. 5B

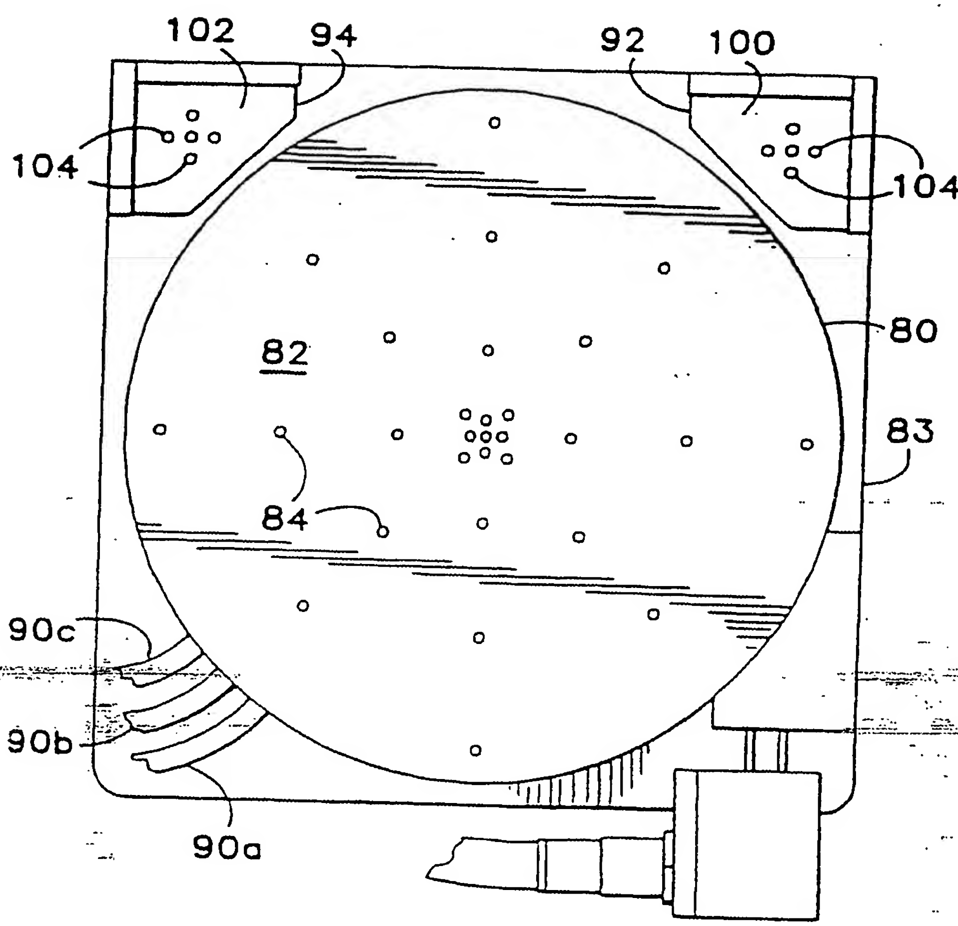

Fig. 6

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